

SABAH FERNS COLLECTED BY JOHN H. BEAMAN

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The following notes are based in large part on new collections from Borneo, the heart of the vast botanical paradise that is Malesia. The southern portion of Borneo, with about 73% of the island's total land area of over 467,000 km², is now Kalimantan in Indonesia, and the remainder is divided into the small nation of Brunei and the two states of East Malaysia, Sarawak and Sabah. Previously called British North Borneo, Sabah is the source of recent expertly made botanical collections by Dr. John H. Beaman of Michigan State University (MSC).

From June 1983 to August 1984 Beaman collected about 4100 numbers of plants, of which 231 are ferns representing 129 species. Nearly all his ferns were obtained in the Crocker Range, which extends from northeastern Sarawak to northern Sabah and dominates the western portion of the latter. The Crocker Range is highlighted by the magnificent Mt. Kinabalu, at 4101 m the highest in Southeast Asia and Malesia outside the central range in New Guinea, and the subject of a delightful volume issued by the Sabah Society (1978). Unfortunately, the precious biota of Mt. Kinabalu is not being adequately protected (Bailes 1985). Because the summit area and upper elevations of Mt. Kinabalu are relatively well-known botanically, Beaman focused his efforts on low and middle elevation forests and gave special attention to the flora on soils derived from ultramafic (mostly serpentine) rocks.

Because of chemical and physical peculiarities, serpentine areas often have a characteristic scrubby vegetation, including some species that seem to be totally restricted to that substrate. Kruckeberg (1964) reviewed ferns (all north temperate) reported as serpentinophilic to varying degree. The most consistent of the reports refer to a European *Asplenium* once named *A. serpentini* Tausch (now *A. cuneifolium* Viv.) and to several North American taxa in *Polystichum*, *Adiantum*, and *Cheilanthes* (*Aspidotis*). Of 609 Jamaican pteridophytes, Proctor (1985, p. 452) noted only one *Polystichum* as confined to serpentine. The precise factors determining affinity to serpentine may not be the same in all cases. Smith (1975), experimenting with *Aspidotis*, discovered that spore germination and gametophytic requirements were not correlated with edaphic preference, which leads to the conclusion that sporophytic needs must be crucial. This may be a high selenium requirement as suggested by Lellinger (1985, pp. 149, 278).

Among the Beaman fern collections, 66 (representing 48 species) were on ultramafic terrain. Eight of his 20 collections discussed in this paper, including six terrestrial and one epiphytic species, were from this type of substrate. Thus it would appear that a disproportionately large percentage of the most significant Beaman fern collections are terrestrial species from ultramafic habitats.

By far the most important reference for Sabah ferns is Christensen and Holttum's *The Ferns of Mount Kinabalu* (1934) in which earlier literature is cited, and which also contains information about the botanical history and fern ecology of

the mountain. Their 417 species do not include those of the surrounding lowlands or the number would have been considerably augmented. Copeland's *Additional Ferns of Kinabalu* (1935) raised the tabulation to 437, and a recent estimate of species known from within only the official boundaries of Kinabalu Park (formerly Kinabalu National Park) is 450 (Holttum 1978). In a study of the pteridophytes of nearby Gunung Mulu in Sarawak, Parris et al. (1984) estimated that only one-third of the 71,000 hectares of Kinabalu Park had been scientifically explored, a figure corroborated by Beaman (pers. comm.), so it is expected that the number of recorded species will continue to increase. This extreme richness in ferns of this single mountain, with perhaps 500 species, may be appreciated by comparing it with the total of 317 species (Lellinger 1985) for the United States and Canada.

Other essential literature for Sabah ferns includes the ongoing revisions for *Flora Malesiana*. Those already published are Gleicheniaceae and Schizaeaceae (Holttum 1959), Cyatheaceae (Holttum 1963), excerpted for Borneo, and including seven tree fern species known only from Kinabalu (Holttum 1974), Lindsaea Group (Kramer 1971), Lomariopsis Group (Holttum & Hennipman 1978) and Thelypteridaceae (Holttum 1982). The phytogeography of some primitive ferns of Mt. Kinabalu was the subject of another paper by Holttum (1964). Tagawa (1974–75) enumerated pteridophytes collected in Sabah by a Japanese expedition in 1968–69. Also relevant are thirteen recent papers by Iwatsuki et al. (1965–84) about pteridophytes of other parts of Borneo.

Instead of listing all the ferns collected by Beaman, I am detailing only those that are especially noteworthy for one reason or another, such as being new records, second collections, or of nomenclatural or geographical interest; also included are a few other notes from specimens of other collectors at MICH. All are arranged in alphabetical order by accepted name. *Adiantum opacum* and *Tectaria balabacensis*, both new records for Borneo, are here first suggested as probable serpentinophiles; other possible candidates are *Adiantum hosei*, *Ctenitis atrorubens*, and *Diplazium beamanii*. A complete set of Beaman's Sabah ferns has been deposited in the University of Michigan Herbarium (MICH).

Acrophorus nodosus Presl, Tent. Pterid. 94, t. 3, f. 2. 1836. *Aspidium nodosum* Bl., Enum. Pl. Jav. 2: 171. 1828, non Willd., 1810. *Acrophorus blumei* Ching ex C. Chr. & Holtt., Gard. Bull. S. S. 7: 226. 1934, nom. superfl.

The earliest description of a species of *Acrophorus* was published by Blume who chose a name previously used by Willdenow. When Presl established *Acrophorus* in 1836, he provided a new name for Blume's species; this is the first valid name available in the genus. The later *A. blumei* is superfluous.

All specimens of *Acrophorus* I have seen from Borneo, the Philippines, and Java have round-reniform dryopteroid indusia, whereas many from elsewhere in Asia have very small convex cystopteroid indusia. Five new species from China were described by Ching & Wu in Wu, Acta Phytotax. Sinica 21: 379–383. 1983, and an unpublished new species in Sarawak is listed by Parris et al. (1984, p. 223). *Acrophorus* is closely allied to *Diacalpe*, *Peranema*, *Stenolepia*, *Nothoperanema*, and *Dryopsis*, the last only recently described by Holttum & Edwards, Kew Bull. 41: 171–204. 1986.

SABAH SPECIMEN (additional to those cited by Christensen & Holttum, 1934): *Beaman 8028*, Tambunan Dist., Crocker Range, 1700–1800 m, terr. in oak-laurel forest, 5°49'N, 116°20'E.

Adiantum hosei Baker, J. Bot. 26: 324. 1888; Tagawa, Acta Phytotax. Geobot. 26: 167. 1975.

A. scabripes Copel., Philip. J. Sci. 7C: 55, pl. 5. 1912; Fern Fl. Philip. 1: 164. 1958.

In this species the acroscopic ends of the lower epidermal cells between veins tend to curl up from the surface and become almost hairlike, resulting in the very rough texture indicated by Copeland's epithet.

Adiantum hosei was originally described from Sarawak and *A. scabripes* from Mindanao. The discovery of the species in Sabah, which is intermediate, was to be expected and was already recorded by Tagawa, who was, however, unaware of the Philippine occurrence. *Adiantum scabripes* is here considered for the first time a synonym of *A. hosei*. In Index Filicum Suppl. 3: 19. 1934, Christensen reduced *A. scabripes* to *A. monosorum* Bak. of the Solomons but retreated from that decision in Dansk Bot. Arkiv 9(3): 54. 1937.

Despite one record from limestone (*Brooks s.n.*, Feb. 1907, Sarawak, Bidi), the distribution of this species leaves open the possibility that it has serpentophilic tendencies.

SABAH SPECIMENS: *Beaman 10302*, Labuk & Sugut Dist., near Karamuak R., 100 m, ultramafic geology, 5°31'N, 117°03'E; *Clemens 30841*, Kinabalu, Penibukan, in canyon, 4000 ft.

Adiantum opacum Copel., Philip. J. Sci. 1 Suppl. 255, pl. 3. 1906; Fern Fl. Philip. 1: 163. 1958.

A. cupreum Copel., Leaf. Philip. Bot. 4: 1152. 1911; Fern Fl. Philip. 1: 163. 1958.

Adiantum opacum described from Palawan and *A. cupreum* from Sibuyan were believed to be Philippine endemics by Copeland; I consider them one species, here first reported from Borneo. Distinguishing characters are the deciduous pinnules and the rachis with stiff hairs above. Because all five collections of this species (four from Palawan) are from ultramafic areas, according to geological information from Hamilton (1979) and the Philippine Bureau of Mines "Geological Map of the Philippines," 1963, and because the species is relatively rare, I believe it to be a true serpentophile.

SABAH SPECIMEN: *Beaman 9054*, Ranau Dist., ultramafic slopes and cliffs on SW side of Lohan R., 750–950 m, 6°00'N, 116°41'E.

Asplenium klossii C. Chr., Gard. Bull. S. S. 7: 278, pl. 60. 1934; Tagawa, Acta Phytotax. Geobot. 27: 139. 1976.

Asplenium klossii is a close relative of *A. tenerum* Forst. but is reliably distinguished by the non-auriculate, cordate-based, subopposite pinnae and the narrow, caudate frond apex. The original description was based on a single collection made near Sandakan. The species was also later reported from near Tawau in southeastern Sabah by Tagawa and thus is apparently endemic to eastern Sabah. Beaman's collection is larger than that described by Christensen, with fronds to 57 × 14 cm bearing up to 13 pairs of pinnae, the largest 8.5 × 1.4 cm.

SABAH SPECIMEN: *Beaman 10198*, near Tawau, epiphytic, 100–120 m, 4°24'N, 117°53'E.

Asplenium lobulatum Mett. ex Kuhn, Linnaea 36: 100. 1869. SYNTYPES: Hawaii, *Remy, Gaudichaud, Meyen* (n.v.).

A. steerei Harr., J. Linn. Soc. Bot. 16: 28. 1877; Copeland, Fern Fl. Philip. 3:

438. 1961; Price, *Contr. Univ. Michigan Herb.* 15: 200. 1982; Parris et al., *Pterid. G. Mulu Nat. Park* 215. 1984. LECTOTYPE: Philippines, Luzon, *Steere s.n.* (MICH).
- A. pseudofalcatum* Hillebr., *Fl. Haw. Is.* 597. 1888. SYNTYPES: Hawaii, specimens from five localities (n.v.).
- A. pseudofalcatum* var. *obtusum* Hillebr., *Fl. Haw. Is.* 598. 1888. SYNTYPES: specimens from three localities (n.v.).
- A. cuneatiforme* Christ, *Bull. Herb. Boiss.* II, 4: 613. 1904; DeVol & Kuo, *Fl. Taiwan* 1: 481. 1975. TYPE: China, Taiwan, *Faurie 661* (n.v.).
- A. laxivenum* Copel., *Philip. J. Sci.* 2C: 132. 1907. TYPE: Philippines, Mindoro, *Merrill 5892* (holotype lost at PNH in 1945; lectotype, here designated: MICH; isoelectotype: US).
- A. cromwellianum* Rosenst., *Fedde's Repert.* 10: 327. 1912; Nakaike, *Bull. Natn. Sci. Mus. Tokyo ser. B*, 9: 95. 1983. TYPE: New Guinea, *Bamler K19* (n.v.).
- A. pseudofalcatum* var. *subintegrum* Rosenst., *Hedwigia* 56: 334. 1915 ('*subintegra*'). TYPE: China, Taiwan, *Faurie 455* (isotype: MICH).
- A. pseudofalcatum* var. *subintegrum* f. *obtusatum* Rosenst., *Hedwigia* 56: 334. 1915 ('*obtusata*'); *A. arisanense* Tag., *J. Jap. Bot.* 14: 707. 1938. TYPE: China, Taiwan, *Faurie 455 bis* (n.v.).
- A. benguetense* Hieron., *Hedwigia* 60: 264. 1919; Price, *Kalikasan* 2: 112. 1974. TYPE: Philippines, Luzon, *Elmer 6012* (isotype: MICH).
- A. ledermannii* Hieron., *Bot. Jahrb.* 56: 150. 1920. SYNTYPES: New Guinea, *Ledermann 10064, 11059, 11066, 12457* (n.v.).
- A. loxocarpum* Copel., *Univ. Calif. Publ. Bot.* 14: 375, t. 59. 1929. TYPE: Sumatra, *Bartlett 6605* (holotype: UC; isotype: MICH).
- A. acutiusculum* auct. non Bl.: Racib., *Pterid. Fl. Buitenz.* 217. 1898; C. Chr. & Holtt., *Gard. Bull. S. S.* 7: 280. 1934, p.p.; Backer & Posth., *Varenfl. Java* 140. 1939; Tagawa, *Acta Phytotax. Geobot.* 27: 140. 1976; Iwatsuki & Kato, *Acta Phytotax. Geobot.* 31: 168. 1980.
- A. insiticium* auct. non Brack.: Brownlie, *Pterid. Fl. Fiji* 222. 1977.

This clearly marked species is distributed from Taiwan to Sumatra, then east to New Ireland (*Croft LAE 65283*), New Caledonia (*Franc 334*, MICH, 3 sheets), Fiji, and Hawaii. In Hawaii, the source of the syntype collections, the variability of the species is greatest and encompasses almost all pinna-shapes and degree of dissection developed elsewhere. In Java, as in Borneo, the species was incorrectly called *A. acutiusculum* Bl., a name now known to be a synonym of *A. longissimum* Bl. (Price 1982).

Another frequent misidentification is as *A. insiticium* Brack., *U. S. Expl. Exped.* 16: 161. 1854; *Atlas* t. 22. 1855. By courtesy of Dr. D. B. Lellinger of the U.S. National Herbarium, I was able to examine Brackenridge's holotype, sheet *US 50453*, collected "in forest, return from Mauna Kea, Hawaii." The specimen is not proliferous, although wrongly described and drawn as such, but otherwise precisely matches the plate. I identify it as a large elaborate form of the non-proliferous *A. contiguum* Kaulf., not a close relative of *A. lobulatum*.

Distinguishing characters of *A. lobulatum* are: rhizome short; fronds pinnate to bipinnate, pinnae subentire to coarsely toothed; lamina texture chartaceous, often gemmiferous along rachis near apex; costae slender and raised above; veins

widely spaced, often 2 mm apart, teeth bluntly pointed, spaced as veins; sori all equally divergent from costa; usually epiphytic at high elevations.

SABAH SPECIMENS: *Clemens* 33140, *Topping* 1814, both from Mt. Kinabalu.

Colysis loxogrammoides (Copel.) Price, comb. nov. *Polypodium loxogrammoides* Copel., Philip. J. Sci. 7C: 65. 1912. TYPE: Sarawak, Limbang, *Sar. Mus. Coll. no. 17, 1910* (MICH).

Polypodium polysorum Brause, Bot. Jahrb. 56: 203. 1920; C. Chr. & Holtt., Gard. Bull. S. S. 7: 308. 1934; *C. polysora* (Brause) Copel., Gen. Fil. 199. 1947. Brause cited four Ledermann syntypes from New Guinea.

Colysis loxogrammoides is a relative of *C. macrophylla* (Bl.) Presl and is distinguished by the scandent, thick, woody rhizome with long, wiry clasping roots; paleae pale brownish-grey, subclathrate with cloudy luminae, margins erose-denticulate; lamina not or only slightly dimorphic, apex long caudate-acuminate; sori with broad receptacles, strong, thick, uninterrupted. An additional synonym may be *Pleopeltis pseudoloxogramma* v. A. v. R., Bull. Jard. Bot. Buitenz. III, 5: 218, fig. b, c. 1922; *Polypodium pseudoloxogramma* (v. A. v. R.) C. Chr., Ind. Fil. Suppl. 3: 156. 1934; *Selliguea pseudoloxogramma* (v. A. v. R.) Ching, Sunyatsenia 5: 260. 1940, although the type from Ceram, *Kornassi 1373* (n.v.), was described by Alderwerelt as having entire paleae.

SABAH SPECIMENS: *Clemens* 26184 (BO, K, MICH), 28642 (K, MICH); *Topping* 1572 (MICH); *Shim Phyu Soon SAN 81676* (K). Also, from Sarawak, G. Mulu Natl. Park, *I. Nielsen 637* (AAU, photocopy kindly sent from K by Dr. B. S. Parris).

Ctenitis atrorubens Holtt., Blumea 31: 29. 1985.

This recently recognized species from the Philippines was represented by only the single specimen at MICH until Beaman's collection confirmed its distinctness, constancy, and continued existence. It may be a serpentinophile although two collections are not a sufficient sample.

SABAH SPECIMEN: *Beaman 10734*, Ranau Dist., Pinosuk Plateau, ca. 8 km ESE of Desa Dairy, 1380 m, ultramafic soil, logged forest, 6°01'N, 116°37'E.

Dicranopteris clemensiae Holtt., Reinwardtia 4: 275. 1957; Fl. Males. II, 1: 32, fig. 14b–c. 1959.

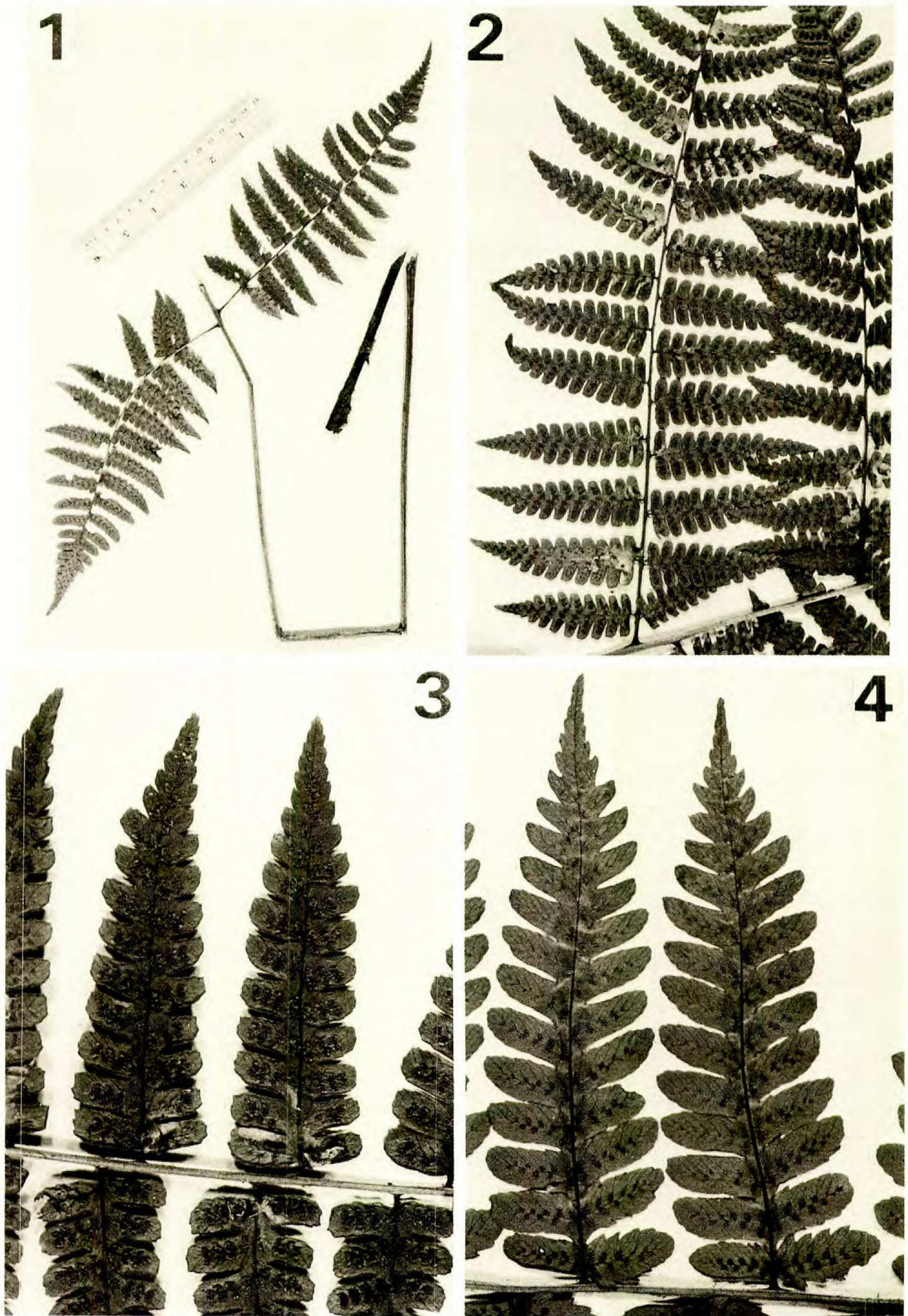
Beaman's gathering is only the second collection, and agrees well in all respects with Holttum's description although the spores were gone. Monolete spores as found in this species are unusual in Gleicheniaceae. Clemens's Kinabalu type collection was made at approximately the same elevation as Beaman's.

SABAH SPECIMEN: *Beaman 8020*, Tambunan Dist., Crocker Range, SW side of ridge in oak-laurel forest, 1700 m, 5°49'N, 116°20'E.

Diplazium beamanii Price, sp. nov.

Figs. 1–3.

Caudex erectus 3 dm altus. Paleae ad bases stipitum castaneae concolorae integrae ovatae usque 10 × 4.5 mm. Lamina ovata, ad basim profunde tripinnatifida; pinnae usque 37 cm longae; pinnulae usque 8 × 2 cm; segmenta subtruncata leviter denticulati-crenulata sinibus angustis separata. Sori 1.0–2.5 mm longi, cos-



FIGS. 1-4. *Diplazium*. 1-3, *D. beamanii*, type collection. 1. Stipe and basal pinnae, $\times 0.2$. 2. Middle pinnae, $\times 0.3$. 3. Pinnules, $\times 0.9$. 4. *D. mollifrons*, isotype (Elmer 22375, MICH); pinnules, $\times 0.9$.

tales vel costulares. Indusia 0.8 mm lata, primo allantoidea, post apertione supra pallide brunnea super soros arcuata, ad marginem erosa, infra hyalina ad laminam appressa. Sporae dilute brunneae sublaeves.

Caudex erect, forming a trunk 3 dm high. Paleae at stipe base castaneous, concolorous, entire, ovate, to 10×4.5 mm. Stipes stramineous, 66 cm long, 7 mm thick at base, sparsely muricate. Lamina ovate, 60 cm long, bipinnate plus deeply pinnatifid at base, rachises strongly papillose within at junctions. Pinnae lanceolate, in alternate pairs, the basal pair slightly reduced and with stalks 2.5 cm long, the subbasal largest, to 37 cm long with stalk 1 cm, basal acroscopic pinnules slightly reduced. Pinnules lanceolate, the largest shortly acuminate, stalked to 1 mm, to 8×2 cm, lobed to ca. 2 mm from costa, the pinnule-costae bearing dark brown contorted irregularly toothed paleae to 2.5×0.7 mm. Segments subtruncate with narrow sinuses, slightly denticulate-crenulate, veins to 5 pairs, usually unbranched. Sori 1.0–2.5 mm long, basal acroscopic sori of a vein-group often diplazioid (paired back-to-back), strictly costal in the pinnules and costular in the lobes. Indusia 0.8 mm wide, allantoid (sausage-shaped) at first, after breaking open along the side farthest away from the vein the upper portion pale brown, arching over sorus, margin erose and irregular, the basal portion underneath the sorus hyaline, appressed to the laminar surface. Spores pale brown, nearly smooth.

TYPE: *Beaman 10724*, Sabah, Ranau Dist., Pinosuk Plateau, ca. 8 km ESE of Desa Dairy, 1380 m, in logged forest by stream in ultramafic terrain, $6^{\circ}01'N$, $116^{\circ}37'E$, 28 July 1984 (holotype: MICH; isotypes: A, K, L, MSC, UKMS).

Diplazium beamanii is closely related to *Athyrium sylvaticum* (Bl.) Milde at least sensu C. Chr. & Holtt., Gard. Bull. S. S. 7: 268. 1934 (Sabah specimens: *Clemens 29591 & 32567 bis*), which differs by stipe-base paleae black-margined and regularly toothed, lamina segments prominently toothed, sori inframedial but not costal, indusia allantoid but uniformly brown (not hyaline below sorus) among other characters. Blume's holotype from Java (*Morton photo 674*) agrees with Clemens's specimens cited above in visible details. Unfortunately, the Javan species appears to have no valid name in *Diplazium*; I therefore provide the following name: ***Diplazium allantoideum*** Price, nom. nov.; *Allantodia sylvatica* Bl., Enum. Pl. Jav. 2: 173. 1828, non *D. sylvaticum* (Bory) Sw., Syn. Fil. 92. 1806.

Diplazium woodwardioides (Presl) Holtt. from Luzon, which appears in Copeland's Fern Fl. Philip. 3: 400. 1961, as *Athyrium sylvaticum*, has a blackish brown indusium opening back to expose a fimbriate margin, not fracturing at the top; uniformly brown stipe paleae; and is constantly smaller in size of pinnules than *D. beamanii* and *D. allantoideum*. Also related is ***Diplazium mollifrons*** (C. Chr.) Price, comb. nov. (basonym: *Athyrium mollifrons* C. Chr., Leaf. Philip. Bot. 9: 3153. 1933), which differs from the three preceding species by pale brown, black-margined, toothed paleae on costae below, \pm rounded segments, indusia brown, 0.5 mm wide, edge fringed with fine hairlike processes (Fig. 4). *Athyrium mollifrons* was incorrectly placed in the synonymy of *A. ophiodontum* Copel. in Fern Fl. Philip. 3: 398. 1961; I identify the latter (Type: *Ramos BS 77188*, holotype: MICH; isotype: NY) as *D. polyodioides* Bl. Both *D. beamanii* and *D. mollifrons* are possible serpentiphiles.

Diplazium dolichosorum Copel., Philip. J. Sci. 1 Suppl. 151. 1906.

This species was described from Mindanao in the southern Philippines and

considered endemic by Copeland, Fern Fl. Philip. 3: 402. 1961. It is a very close relative of *D. dilatatum* Bl., originally from Java, but my examination of Javan specimens precisely matching Blume's type shown in *Morton photos 940 & 941* reveals the following differences.

Basal sori to 13 mm long; pinnules broadly lanceolate, abruptly narrowed near apex; main rachis muricate; indusia entire. *D. dolichosorum*.

Basal sori to 7 mm long; pinnules deltoid-lanceolate, gradually tapered to apex; main rachis nearly smooth; indusial margin fimbriate-laciniate. *D. dilatatum*.

SABAH SPECIMEN: *Beaman 10641*, Ranau Dist., road from Lohan to Mamut Copper Mine, 1000 m, in dipterocarp forest, trunk-forming, 6°01'N, 116°41'E.

Grammitis palasaba Price, nom nov. *Acrosorus nudicarpus* Zamora & Co, Nat. Appl. Sci. Bull. 32: 47, f. 4. 1980, non *Grammitis nudicarpa* Copel., 1942. TYPE: Philippines, Palawan, Mt. Mantalingahan, 1700 m, epiphytic in mossy forest, *L. L. Co 1776* (isotype: MICH).

Polypodium alternidens auct. non Ces.: C. Chr. & Holtt., Gard. Bull. S. S. 7: 299. 1934, p.p.

This species is now known from two sites about 300 km apart, the type locality in southern Palawan and Mt. Kinabalu. I have seen two Kinabalu collections, made on the same date and in the same place.

As pointed out by Zamora and Co, this species fails to fit acceptably into any of the grammitid genera as formulated by Copeland. It might be a *Xiphopteris*, but the type of that genus is not different in basic characters from *Cochlidium* (Bishop 1978), which in turn merges with *Grammitis*, as argued by Proctor (1985, p. 554). For example, the New Guinean *X. conjunctisora* (Bak.) Copel. is hardly separable from *Grammitis* as indicated by Parris (1983, p. 83). Leaving this species in *Acrosorus* is not satisfactory, because its affinities are rather with *X. alternidens* (Ces.) Copel., synonym *X. murudensis* (Copel.) Copel., of Sarawak, a smaller plant of thin texture, strongly ascending unfolded segments, and pale costal hairs, and *X. hieronymusii* (C. Chr.) Holtt. of the Malay Peninsula, also a relatively thin-textured species with pale costal hairs. *Grammitis palasaba* has deciduous, usually paired, maroon setae ca. 0.3 mm long on the costa of young fronds and a thick rigid texture. The epithet *palasaba* is a compound of Palawan and Sabah.

SABAH SPECIMENS: *Clemens 10721 & Topping 1726*, Mt. Kinabalu, Paka Cave to Lobang, 15 Nov. 1915 (the Clemenses and Topping collected together).

Hymenophyllum microchilum (Bak.) C. Chr., Mitt. Inst. Allg. Bot. Hamburg 7: 143. 1928; C. Chr. & Holtt., Gard. Bull. S. S. 7: 212. 1934; Croxall in Parris et al., Pterid. G. Mulu Nat. Park 185. 1984.

Originally described from Mt. Kinabalu, this species was included in *H. polyanthos* (Sw.) Sw. by Copeland, Philip. J. Sci. 64: 97, 101. 1937, a species he placed in *Mecodium* after dividing up *Hymenophyllum*. Beaman's specimen, however, clearly shows that the species, with its receptacle exerted (when intact) and involucre cleft less than halfway, is not only distinct from *H. polyanthos* but should not even have been considered a *Mecodium*. In Copeland's scheme of classification of Hymenophyllaceae, *H. microchilum* might be a *Meringium*; in the most recent classification, it belongs in *Hymenophyllum* subgen. *Chilodium* sect.

Pseudomecodium Iwatsuki, Acta Phytotax. Geobot. 35: 172. 1984, a placement kindly confirmed by Dr. K. Iwatsuki (in litt.).

SABAH SPECIMEN (other than cited by Christensen and Holttum, 1934): *Beaman 8024*, Tambunan Dist., Crocker Range, 1700–1800 m, 5°49'N, 116°20'E.

Lindsaea gueriniana (Gaud.) Desvaux, Prodr. 312. 1827; Kramer, Fl. Males. II, 1: 230, f. 36. 1971.

This species is here reported for the first time from Sabah; the previously recorded range encompasses the Philippines and Sulawesi east to Tahiti and also Sarawak. Substrates reported include limestone, decayed wood, and serpentine.

SABAH SPECIMEN: *Beaman 9055*, Ranau Dist., steep ultramafic slopes and cliffs on SW side of Lohan R., low stature forest, 750–950 m, 6°00'N, 116°41'E.

Microsorium mindanense (Chr.) Copel., Gen. Fil. 196. 1947; Fern Fl. Philip. 3: 486. 1961.

Previously thought to be a Philippine endemic, this species is a member of the *M. heterocarpum* group, and is distinguished by the broad, more or less nest-forming frond base, and the costa strongly raised on both sides, sharply carinate below.

SABAH SPECIMEN: *Beaman 8820*, Penampang Dist., km 41, epiphytic at 1050 m, 5°51'N, 116°17'E.

Microsorium sarawakense (Bak.) Holtt., Ferns of Malaya 175, f. 84. 1955; Iwatsuki & Kato, Acta Phytotax. Geobot. 32: 122. 1981. *Polypodium sarawakense* Bak., Bot. J. Linn. Soc. 22: 228. 1886; C. Chr. & Holtt., Gard. Bull. S. S. 7: 307. 1934.

Microsorium rizalense Copel., Philip. J. Sci. 81: 42. 1952; Fern Fl. Philip. 3: 478. 1961. TYPE: Philippines, Luzon, Rizal Prov., Mt. Lumutan, *Ramos & Edaño BS 29648* (holotype: US; isotypes: MICH, NY).

This species is of particular taxonomic interest, because I believe it clearly unites (in agreement with Sledge, Bot. Bull. Brit. Mus. 2: 144. 1960) the two genera *Microsorium* and *Phymatodes* (a name that should be retained according to Ching, Acta Phytotax, Sinica 16(4): 32. 1978) or *Phymatosorus* (proposed to replace *Phymatodes* by Pic. Ser., Webbia 28: 457. 1973).

Microsorium sarawakense has already been known from Sumatra, Malay Peninsula, and Borneo (Sarawak, Sabah, East Kalimantan); with the reduction of *M. rizalense* its range is extended over 1000 km to the North, and a collection from Ilocos Norte Prov. (Solsona, 18°09'N, 120°56'E, *Price 2900*) provides a further substantial northern range extension.

SABAH SPECIMENS (additional to those cited by Christensen and Holttum, 1934): *Beaman 7936*, Tambunan Dist., Crocker Range, epiphyte at 1450 m, 5°47'N, 116°20'E; *Beaman 9806*, NW side of Mt. Kinabalu, 800–1000 m in dipterocarp forest, 6°11'N, 116°34'E.

Prosaptia venulosa (Bl.) Price, comb. nov. *Polypodium venulosum* Bl., Enum. Pl. Jav. 2: 128. 1828; C. Chr. & Holtt., Gard. Bull. S. S. 7: 303. 1934. *Ctenopteris venulosa* (Bl.) Kunze, Bot. Zeit. 4: 425. 1846; Copel., Fern Fl. Philip. 3: 531. 1961. *Grammitis venulosa* (Bl.) R. & A. Tryon, Rhodora 84: 129. 1982.

This is the type species of the genus *Ctenopteris* which, as I argued in Contr. Univ. Michigan Herb. 15: 202. 1982, must be reduced to *Prosaptia*; an additional

generic character is the absence of hydathodes. The correct authority for the closely related *P. obliquata* is (Bl.) Mett. rather than the new combination proposed in my 1982 paper.

SABAH SPECIMENS (not previously cited): *Clemens* 31794, 33738, 50921, all from Mt. Kinabalu.

Pycnoloma metacoelum (v. A. v. R.) C. Chr., Dansk Bot. Arkiv 6(3): 77, pl. 8, f. 3; pl. 9, f. 2; pl. 10, f. 2. 1929; Parris et al., Pterid. G. Mulu Nat. Park 194. 1984. *Drymoglossum metacoelum* v. A. v. R., Bull. Jard. Bot. Buitenz. II, 28: 21, t. 2. 1918.

Beaman's collection is the first Sabah record. This species was previously known from Kalimantan, Sarawak, and the Malay Peninsula.

SABAH SPECIMEN: *Beaman* 10658, Ranau Dist., road from Lohan to Mamut Copper Mine, epiphyte high in montane dipterocarp forest, 1100 m, 6°01'N, 116°41'E.

Pyrrosia platyphylla Hovenk., Blumea 30: 207. 1984; Monog. Pyrrosia 222. 1986.

Cyclophorus beddomeanus auct. non (Gies.) C. Chr.: Merrill, Univ. Calif. Publ. Bot. 15: 12. 1929.

Pyrrosia costata auct. non (Presl) Tag. & Iwats.: Iwats. & Kato, Acta Phytotax. Geobot. 32: 121. 1981.

This recently described species is similar in general appearance to the Philippine *P. splendens* (Presl) Ching, which differs by the frond margin being revolute and thickened and the stellate laminar hairs having long acicular arms. Close to *P. splendens* is *P. princeps* (Mett.) Morton [synonym: *P. aglaophylla* (Copel.) Copel.] of New Guinea. *Pyrrosia stigmosa* (Sw.) Ching of Java, Sumatra, Malaya, etc., differs by having the costa more or less rounded below (not carinate) and the lamina rapidly contracted downwards into a well-defined stipe. *Pyrrosia costata* (Presl) Tag. & Iwats. of the eastern Himalayas has the costa broadly rounded below and the laminar stellate hairs with lanceolate arms forming only a relatively thin layer. Hair types in *Pyrrosia* were reclassified by Shing, Amer. Fern J. 73: 73–78. 1983, and elaborated upon by Hovenkamp, Monog. Pyrrosia 40–48. 1986, who included all the species mentioned above in the "*P. costata* group."

The type of *P. platyphylla*, *Elmer* 20659 (isotype: MICH), was collected near Tawau in southeastern Sabah, near the border with Indonesian Kalimantan. The collections of Beaman are apparently the first from the main mountain mass of Mt. Kinabalu.

ADDITIONAL SABAH SPECIMENS: *Beaman* 8364 & 9243, Ranau Dist., epiphyte in low stature forest on steep ultramafic slopes and cliffs on SW side of Lohan R., 700–900 m, 6°00'N, 116°41'E.

Selliguea kamborangana (C. Chr.) Price, comb. nov. *Polypodium kamboranganum* C. Chr., Gard. Bull. S. S. 7: 306. 1934. TYPE: Sabah, Mt. Kinabalu, Kamborangah, *Holtum* 25543 (BM, n.v.).

Christensen's statement of affinity (to *Polypodium costulatum* of Sumatra) and description of the paleae as dense, entire, lanceolate, long-acuminate, and reddish brown serve to identify his plant as very probably conspecific with two sterile collections from Palawan, Mt. Mantalingahan, *Edaño PNH* 471 & 478 (both MICH). This note thus reports a second and third collection of this rare species, its range extension from Sabah to the Philippines, and also that sterile fronds may be much larger than previously known, to 19.7 × 6.2 cm (described by Christensen as up to 10 × 2 cm).

Tectaria balabacensis (Christ) Price, *Kalikasan* 1: 37. 1972. *Ctenitis balabacensis* (Christ) Copel., *Gen. Fil.* 124. 1947; *Fern Fl. Philip.* 2: 294. 1960.

Dryopteris escriptorii v. A. v. R., *Bull. Jard. Bot. Buitenz. II*, 23: 10. 1916; Price, *Kalikasan* 2: 110. 1974.

This unusual free-veined species of *Tectaria* has not been recorded outside the Philippines, although it may not be distinct from *T. trichotoma* (Fée) Tag. of Vietnam. On the basis of information from the geological sources cited above under *Adiantum opacum*, I believe that *T. balabacensis* (Philippine distribution: Balabac, the type; Palawan, four colls.; Sibuyan, two colls.; S. Luzon, Quezon Prov., one coll.) and the extremely similar *T. mesodon* (Copel.) Price (NW Mindanao, two colls.) and *T. laxa* (Copel.) Price (Luzon, Ilocos Norte Prov., seven colls.) are probable serpentinophiles.

SABAH SPECIMEN: *Beaman 9059*, Ranau Dist., on steep ultramafic slopes and cliffs on SW side of Lohan R., 750–950 m in low stature forest, 6°00'N, 116°41'E.

Tectaria zeilanica (Houtt.) Sledge, *Kew Bull.* 27: 422. 1972. *Leptochilus zeilanicus* (Houtt.) C. Chr.; Copel., *Sarawak Mus. J.* 2: 373. 1917; Ogata, *Icon. Fil. Jap.* 1: pl. 32. 1928, ('*zeylanicus*'). *Quercifilix zeilanica* (Houtt.) Copel., *Philip. J. Sci.* 37: 409. 1928; Ching, *Icon. Fil. Sin.* 3: pl. 118. 1935; DeVol & Kuo, *Fl. Taiwan* 1: 338, pl. 120. 1975, ('*zeylanica*').

Although widely distributed in southern Asia and around the borders of the South China Sea (including Vietnam, Hainan, Guangxi, Guangdong, Hong Kong, Taiwan, and Pulau Tioman off the coast of the Malay Peninsula), this oft-illustrated species has not been reported from Borneo in recent years, and even its occurrence there was considered doubtful by Sledge. The first Bornean record was published by Copeland (1917, see synonymy), citing the localities Jesselton and Kudat, but not naming any specimens. There is indeed a specimen at MICH, *Topping 1931*, Jesselton (now Kota Kinabalu), collected in 1915. The species should be expected in Palawan and northwestern Luzon but has yet to be found in the Philippines.

Another species whose distribution almost completely rings the South China Sea but which is still awaiting discovery in Palawan or anywhere in the Philippines is *Pteris grevilleana* Wall. ex Agardh (additional Sabah specimen: *Beaman 10587b*, Ranau Dist., Bukit Lugas, Kg. Himbaan, 1250–1300 m, 5°57'N, 116°34'E).

Vittaria incurvata Cav., *Descr. pl.* 270. 1802; C. Chr., *Dansk Bot. Arkiv* 9(3): 24. 1937.

Although *V. incurvata* was described originally from Guam, many recent authors have inexplicably taken up later names, such as *V. elongata* Sw., described from southern India, in its stead for plants of Oceania and Malesia. Plants from Guam appear to differ from those of Sabah only by the paleae, in the former 7–12 mm long and subentire or minutely toothed only near base, in the latter 3–5 mm long and minutely toothed throughout. This difference might be sufficient to define a species in a difficult genus such as *Vittaria*; however, in islands near Guam, plants otherwise inseparable from topotypic *V. incurvata* have smaller and toothed paleae, which demonstrates that the Guam populations are at most a local variety. I am grateful to Dr. Lynn Raulerson of GUAM for sending me an excellent series of specimens from Guam, Saipan, Rota, Yap, and Palau for study.

SABAH SPECIMENS: *Beaman 10569*, Ranau Dist., Bukit Lugas, Kg. Himbaan, 1250–1300 m, epiphyte high on bamboo, 5°57'N, 116°34'E; *Clemens 9486, 10007; Topping 1372, 1552*.

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